BOSE®

ESP-880
ESP-1240
ESP-4120

ControlSpace®

Engineered Sound Processors

Installation Guide

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Thank you for selecting Bose® ControlSpace ESP processors for your sound reinforcement system. This document is intended to provide professional installers with basic installation and safety guidelines for Bose® ControlSpace ESP processors in typical fixed-installation systems. Please read this document before attempting installation.

WARNINGS:

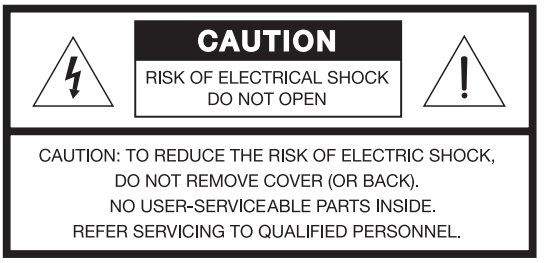
- **This product is intended for installation by professional installers only.**
- Do not expose this apparatus to dripping or splashing, and do not place objects filled with liquids such as vases, on or near the apparatus. As with any electronic products, use care not to spill liquids into any part of the system. Liquids can cause a failure and/or a fire hazard.
- To reduce the risk of fire or electric shock, do not expose this apparatus to rain or moisture.
- Do not place any naked flame sources, such as lighted candles, on or near the apparatus.
- To prevent electric shock, match the wide blade of the line cord plug to the wide slot of the AC (mains) receptacle. Insert fully.

CAUTIONS:

- This product shall be connected to a mains socket outlet with a protective earthing connection.
- Use of controls or adjustments or performance of procedures other than those specified herein may result in hazardous radiation exposure. The product should not be adjusted or repaired by anyone except properly qualified service personnel.
- Make no modifications to the system or accessories. Unauthorized alternations may compromise safety, regulatory compliance, and system performance.

NOTES:

- **The product must be used indoors. It is neither designed nor tested for use outdoors, in recreational vehicles, or on boats.**
- Where the mains plug or appliance coupler is used as the disconnect device, such disconnect device shall remain readily operable.
- See the additional instructions on the Important Safety Instructions sheet (North America only) enclosed in the shipping carton.
- Provide an earth connection before the main plug is connected to the mains.


CAUTION
RISK OF ELECTRICAL SHOCK
DO NOT OPEN
CAUTION: TO REDUCE THE RISK OF ELECTRIC SHOCK,
DO NOT REMOVE COVER (OR BACK).
NO USER-SERVICEABLE PARTS INSIDE.
REFER SERVICING TO QUALIFIED PERSONNEL.

The lightning flash with arrowhead symbol, within an equilateral triangle, is intended to alert the user to the presence of uninsulated dangerous voltage within the system enclosure that may be of sufficient magnitude to constitute a risk of electrical shock.

The exclamation point within an equilateral triangle, as marked on the system, is intended to alert the user to the presence of important operating and maintenance instructions in this installation guide.

Important Safety Instructions

1. **Read these instructions.**
2. **Keep these instructions –** for future reference.
3. **Heed all warnings –** on the product and in the owner's guide.
4. **Follow all instructions.**
5. **Do not use this apparatus near water or moisture.**
6. **Clean only with a dry cloth.**
7. **Do not block any ventilation openings. Install in accordance with the manufacturer's instructions.**
   To ensure reliable operation of the product and to protect it from overheating, put the product in a position and location that will not interfere with its proper ventilation.
8. **Do not install near any heat sources, such as radiators, heat registers, stoves, or other apparatus (including amplifiers) that produce heat.**
9. **Do not defeat the safety purpose of the polarized or grounding-type plug. A polarized plug has two blades with one wider than the other. A grounding-type plug has two blades and a third grounding prong. The wider blade or third prong are provided for your safety. If the provided plug does not fit in your outlet, consult an electrician for replacement of the obsolete outlet.**
10. **Protect the power cord from being walked on or pinched, particularly at plugs, convenience receptacles, and the point where they exit from the apparatus.**
11. **Only use attachments/accessories specified by the manufacturer.**

12. **Use only with the cart, stand, tripod, bracket, or table specified by the manufacturer or sold with the apparatus. When a cart is used, use caution when moving the cart/apparatus combination to avoid injury from tip-over.**

13. **Unplug this apparatus during lightning storms or when unused for long periods of time to prevent damage to this product.**
14. **Refer all servicing to qualified service personnel. Servicing is required when the apparatus has been damaged in any way such as power-supply cord or plug is damaged; liquid has been spilled or objects have fallen into the apparatus; the apparatus has been exposed to rain or moisture, does not operate normally, or has been dropped.** Do not attempt to service this product yourself. Opening or removing covers may expose you to dangerous voltages or other hazards. Please call Bose to be referred to an authorized service center near you.
15. **To prevent risk of fire or electric shock, avoid overloading wall outlets, extension cords, or integral convenience receptacles.**
16. **Do not let objects or liquids enter the product –** as they may touch dangerous voltage points or short-out parts that could result in a fire or electric shock.
17. **See product enclosure for safety related markings.**
18. **No naked flame sources, such as lighted candles, should be placed on the apparatus.**
19. **The mains plug is used to disconnect the device and it shall remain readily operable. To completely disconnect the power input, the mains plug of the apparatus shall be disconnected from the mains.**
20. **The POWER indicator LED will illuminate green when the product has mains power. If power is applied and the LED is not illuminated, or if the LED is red, please send the unit for service.**

CE Bose Corporation hereby declares that this product is in compliance with the essential requirements and other relevant provisions of Directive 1999/5/EC and all other applicable EU directive requirements. The complete declaration of conformity can be found at: www.Bose.com/compliance.

This product meets the immunity requirements for the E2 class EN55103-2 directive.

Inrush current at cold start, 230V: 9.47A

Inrush current after interruption for 5 sec, 230V: 41.16A

Information about products that generate electrical noise

If applicable, this equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to Part 15 of the FCC rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, this is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, you are encouraged to try to correct the interference by one or more of the following measures:

- Reorient or relocate the receiving antenna.
- Increase the separation between the equipment and receiver.
- Connect the equipment to an outlet on a different circuit than the one to which the receiver is connected.
- Consult the dealer or an experienced radio/TV technician for help.

This product complies with the Canadian ICES-003 Class B specifications.

General precautions

CAUTION: Place the unit where it will be protected from heat and allow adequate ventilation. Place the unit away from direct heat sources, such as heating vents and radiators. Make sure the air can circulate freely behind, beside and above the unit.

Do not allow the chassis to exceed the maximum operating temperature of 50˚C. Be aware of conditions in an enclosed rack that may increase the temperature above room ambient conditions.

CAUTION: Be sure all the fine strands of the wire are twisted together and contained within the connector. If even one strand is loose and can touch the adjacent terminal, a short circuit may occur.

The information furnished in this guide does not include all of the details of design, production, or variations of the equipment. Nor does it cover every possible situation which may arise during installation, operation, or maintenance. If you need assistance beyond the scope of this installation guide, please contact our Customer Service department.

Introduction

Thank you for choosing the Bose® ControlSpace® ESP-880/1240/4120 engineered sound processors.

Bose ControlSpace ESP-880, ESP-1240, and ESP-4120 engineered sound processors are single-rack-space DSPs, available in analog I/O configurations of 8 x 8, 12 x 4, and 4 x 12. These cost-effective models meet today's strict requirements for low latency audio processing with high-quality digital conversion and powerful DSP.

Bose® ControlSpace® Designer™ software, available as a free download from **pro.Bose.com**, enables PC setup, control, and monitoring of Bose ControlSpace ESP processors, controls, and PowerMatch® power amplifiers over standard Ethernet networks. Details on making a network connection to ESP processors can be found on page 19.

This document delivers basic installation information. A separate document, the *ControlSpace Designer Software Guide* can be downloaded as a PDF from **pro.Bose.com** or can be found inside the ControlSpace Designer software help system.

The information furnished in this guide is intended to help you install and set up the product, but does not include all details of design, production, or variations of the equipment. Nor does it cover every possible situation that may arise during installation, operation, or maintenance. If you need assistance beyond the scope of this guide, please contact your local Bose Representative or Technical Support specialist. (See contact information in the back of this guide.)

Online Resources

pro.Bose.com	Main resource for product information, downloads, tech data sheets.
proForum.Bose.com	Register and participate in forum user groups to post questions, interface with Bose staff, and share application information on this product.

Product Features

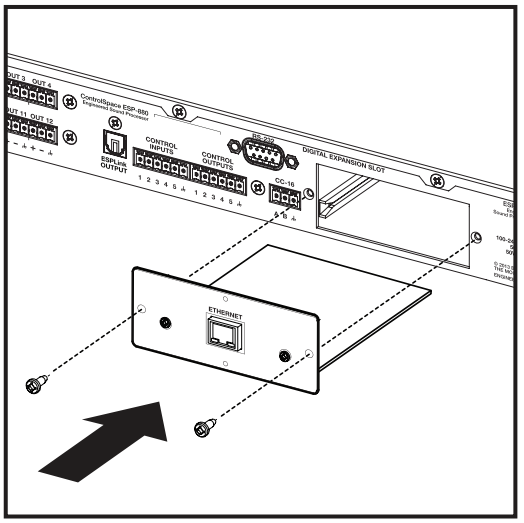
- **Three single-rack ESP models**
  Choice of 8 x 8, 12 x 4 or 4 x 12 analog I/O allows for more flexibility in routing of the signal path.
- **High-quality analog circuitry**
  Provides ultra-low distortion and noise (0.002% THD+N) and >115 dB analog dynamic range (A-weighted, input to output).
- **Advanced, open-architecture DSP**
  48 kHz sample rate/24-bit conversion and a fixed/floating-point DSP. Allows an open arrangement of low-latency signal processing and control functions using ControlSpace Designer software.
- **Front-panel RJ-45 Ethernet connection**
  Allows localized configuration of the processor for stand-alone operation, or when used together with an optional rear-panel network card, serves as a convenient network passthrough for connection to the main control network.
- **Integrated Bose® ESPLink output**
  Provides an 8-channel low-latency digital audio link to PowerMatch® amplifiers located in the same equipment rack.
- **Expansion card slot**
  Supports the use of accessory cards including network control and audio transport options.
- **One-wire networking using expansion cards**
  Optional audio networking cards leverage connections combining streaming audio and control on the same cable, eliminating the need for two separate network connections.
- **Bose ControlSpace Designer software**
  Offers a large set of signal processing modules such as automatic microphone mixing, multiband graphic and parametric EQs, Bose loudspeaker EQ libraries, signal generators, routers, mixers, AGCs, duckers, gates, compressors, source selectors and delays. With ControlSpace Designer software it is possible to design, configure, control and monitor all Bose networked system electronics from a single software application.
- **A variety of control options**
  All models are compatible with Bose CC-64 and CC-16 programmable controllers and three simplified zone volume interfaces in addition to potentiometers and switches offered by other manufacturers.
- **Integration with third-party control systems and remotes**
  Built-in RS-232 serial, Ethernet, and GPIO ports provide solid integration with industry-standard control systems and third-party user controls.

Available Accessories

Accessory Cards

ControlSpace® ESP-880/1240/4120 processors offer a rear panel digital expansion slot for adding network audio and control capabilities beyond what is available using the front panel RJ-45 connector. For systems requiring control network connections to be located on the rear panel (without streaming audio), the ControlSpace Network Control card is recommended for use.

Figure 1. ControlSpace Network Control card



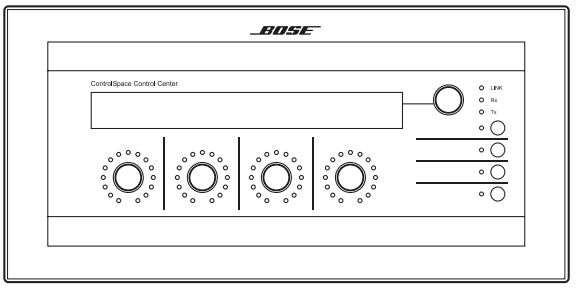
At time of print, the following expansion cards are available. For further information on these cards, and to view new cards that are available, please visit **pro.Bose.com**.

- ControlSpace ESP-880/1240/4120 Network Control card PC 359841-0010
- ControlSpace ESP-880/1240/4120 Dante™ network card PC 359842-0020

User Control Interfaces

ESP-880/1240/4120 processors are compatible with Bose® programmable controllers and three types of simplified volume/zone controls. The following interfaces can be used with the ESP-880/1240/4120 engineered sound processors:

Figure 2. ControlSpace® CC-64 control center

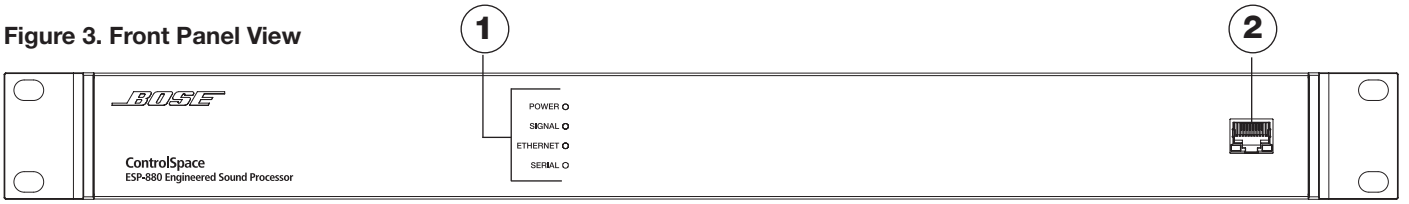


- **ControlSpace CC-64 control center (PC 041760) (Figure 2)**
  Network control of any Bose networkable hardware.
- **ControlSpace CC-16 zone controller (PC 041761)**
  Uses CC-16 port. Up to 15 devices can be used with any ESP engineered sound processor.
- **ControlSpace CC-4 room controller (PC 042023)**
  Uses GPI port: Requires 5 control inputs and one ground termination.
- **Volume Control with A/B switch user interface (PC 041967)**
  Uses GPI port: Requires 2 control inputs and one ground termination.
- **Volume Control user interface (PC 041966)**
  Uses GPI port: Requires 1 control input and one ground termination.

Product Overview

Front Panel

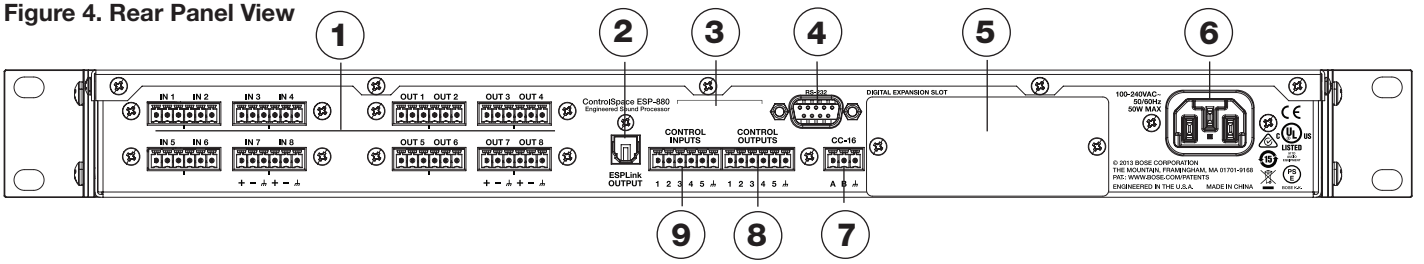
Figure 3. Front Panel View



1. LED Indicators: Power, Signal, Ethernet and Serial indication. (See “Front Panel LED Indicators” below.)
2. Ethernet Connector: RJ-45 jack for front panel network connectivity. (See “Network Connections” on page 19.)

Rear Panel

Figure 4. Rear Panel View



1. Analog audio connectors: Mic/line-level balanced input and line-level output connectors. (See “Analog Audio Connections” on page 16.)
2. ESPLink output connector: For use with ESPLink-equipped PowerMatch® amplifiers.
3. Chassis serial number.
4. RS-232: 5-wire, RS-232 (DTE) serial interface connection. (See “RS-232 Connector” on page 17.)
5. Digital expansion slot: Supports optional digital expansion cards.
6. AC Mains receptacle: Power cord connection. (IEC 60320-C14 inlet).
7. CC-16 connector: RS-485 network connection for up to 15 Bose CC-16 zone controllers. (See “CC-16 Connector” on page 17.)
8. Control Outputs connector: Five general-purpose control outputs. (See “General Purpose Outputs” on page 18.)
9. Control Inputs connector: Five general-purpose inputs. (See “General Purpose Inputs” on page 18.)

Front Panel LED Indicators

POWER	*Power, booting, or fault-state indication* • Green: Power on, normal operation • Yellow: Booting • Red: Fault error (See “Troubleshooting” on page 20.)
SIGNAL	*Prioritized signal status indication of all audio input and output channels, listed by order of signaling priority. For precise metering and gain control, connect using ControlSpace® Designer™ software.* • Green: Signal present on one or more channels • Yellow: Signal level optimal (-20 dBFS to -2 dBFS) on one or more channels • Red: Clipping (> -2 dBFS) found on one or more channels
ETHERNET	*Connection status indication of front panel and/or option card Ethernet ports.* • Green: Link established • Yellow: Tx/Rx activity
SERIAL	*RS-232 and CC-16 serial command status indication.* • Green: CC-16 controller command transmitted • Yellow: CC-16 controller command received • Red: RS-232 Rx/Tx activity

Hardware Installation

Use the following procedure when setting up a ControlSpace® ESP-880/1240/4120 engineered sound processor for the first time.

1. Download and install the latest version of ControlSpace® Designer™ software
2. Unbox the ESP processor
3. Install option card
4. Rack-mount the ESP processor
5. Make analog audio I/O connections
6. Make CC-16, RS-232, and ESPLink connections
7. Connect GPIO devices
8. Establish a network connection
9. Connect the power cable
10. Configure the ESP processor using ControlSpace Designer software

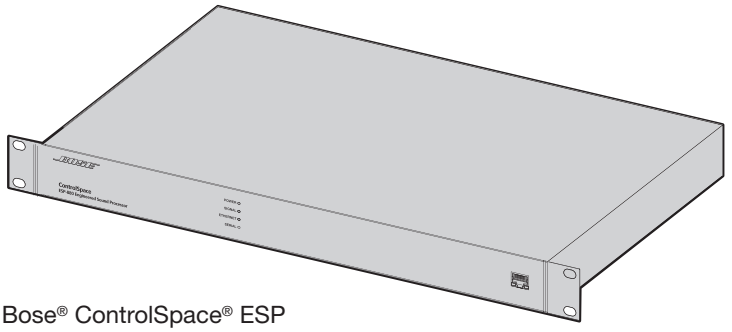
1. Download and install the latest version of ControlSpace Designer software

Install ControlSpace Designer software prior to working with the ControlSpace ESP processor. Visit **pro.Bose.com** to download the latest software version which includes product firmware, the latest algorithms, and a detailed help system that guides system designers and installers through configuring the ESP processor for use in high-quality audio systems.

2. Unpacking

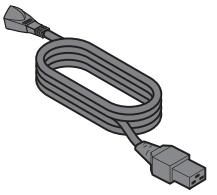
The product box includes the following items. Inspect all components for shipping damage and contact your Bose Representative if any issues are found.

Figure 5. Carton Contents

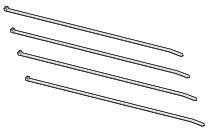


Bose® ControlSpace® ESP

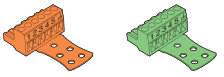
Installation Guide



Power cord



Cable ties (11)



Control I/O connectors (2)

Phoenix Contact® dual channel audio connectors (8)

CC-16 connector

3. Expansion Card Installation

Expansion cards insert into the rear-panel digital expansion slot of the ESP processor. Refer to the documentation included with each card for specific installation instructions.

4. Rack-Mounting

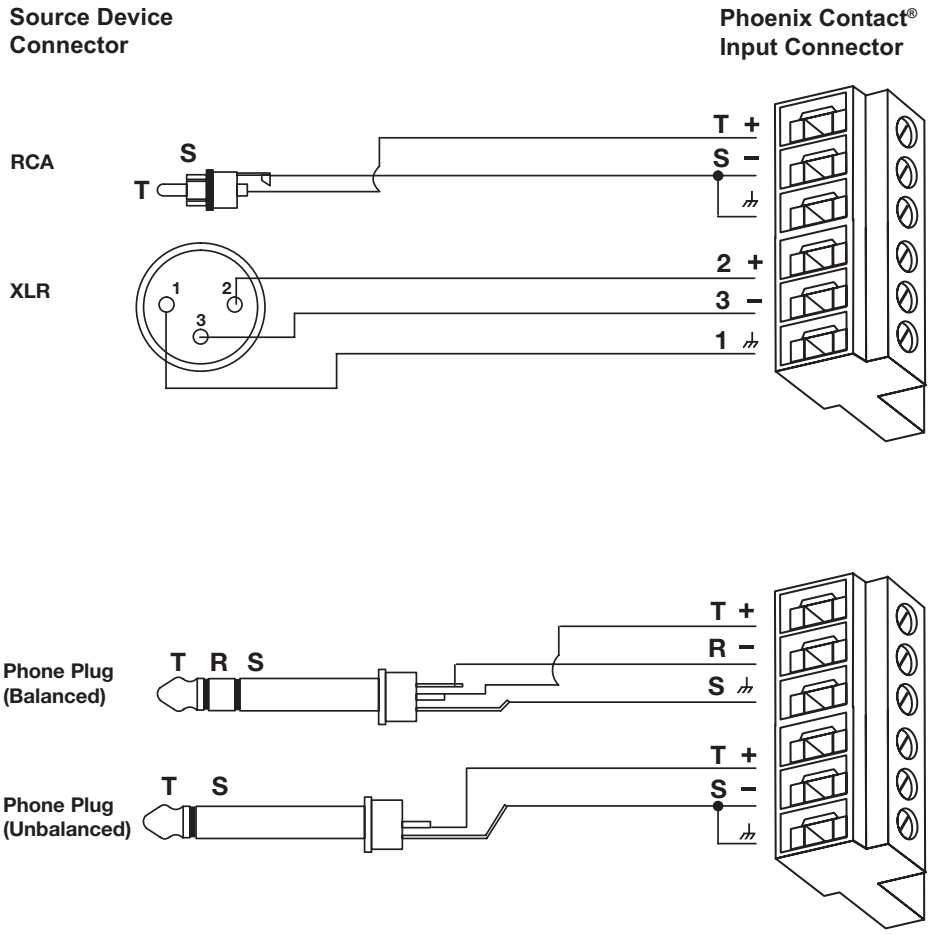
ESP-880/1240/4120 processors are designed to fit standard 19-inch (48 cm) rack equipment, occupying 1 rack-unit (RU) in height, and requiring a mounting depth of 8.2 inches (208 mm) from the front rack rail. Use four fasteners with washers (not supplied) to mount the processor.

The product uses passive (fan-less) side ventilation and can safely operate in ambient conditions from 32°F - 122°F (0°C - 50°C). Refer to page 21 for power dissipation ratings.

5. Analog Audio Connections

The ESP processor includes balanced dual-channel (6-terminal) Phoenix Contact® audio connectors. To help with ease of installation, the termination end of each connector includes printed terminal block descriptions. The following diagram shows recommended balanced/unbalanced wiring between the processor audio connectors and common audio plugs used to connect the ESP processor to external audio components.

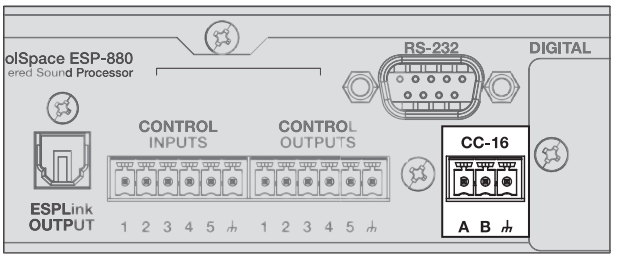
Figure 6. Wiring Balanced and Unbalanced Devices



6. CC-16, RS-232, and ESPLink connections

CC-16 Connector

The CC-16 connector is an RS-485 network connection for use with Bose CC-16 zone controllers. Using the supplied Phoenix Contact® 3-pin labeled connector, up to 15 CC-16 zone controllers can be networked to control the ESP processor or any device on the Bose® ControlSpace® control network. An external power supply is required. Note that in addition to wiring the A and B terminals, it is highly recommended to connect the ground terminal from the ESP processor to each CC-16 zone controller. The maximum distance from ESP processor to any CC-16 is 2000 feet (610 m).



RS-232 Connector

The RS-232 connector provides a DB-9 male connector (type DTE) for communication between the ESP processor and other serial-controlled devices including third-party control systems.

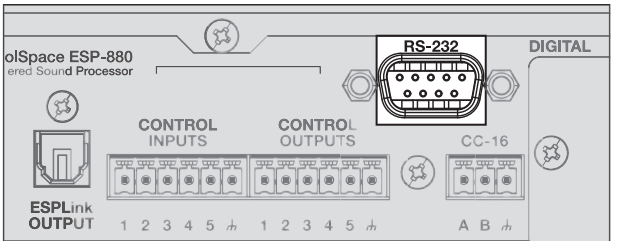
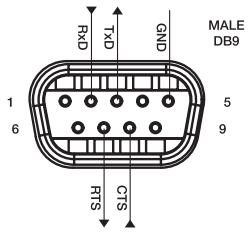


Figure 7. RS-232 Panel Connector Pinout



The default serial port settings are 115,200 baud, 8-bits length, 1 stop bit, no parity, and no flow control. If required these settings can be changed using ControlSpace® Designer™ software.

The document ControlSpace® Serial Control Protocol (downloadable from **pro.Bose.com**) outlines all supported command strings and functions available to control/query Bose ESP processors and PowerMatch® power amplifiers.

ESPLink Connector

The ESPLink connector provides a low-latency method for transporting up to 8 channels of uncompressed audio to PowerMatch® amplifiers. For use with standard optical (TOSLINK™) cables.

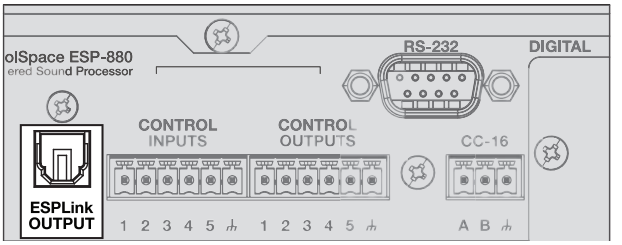
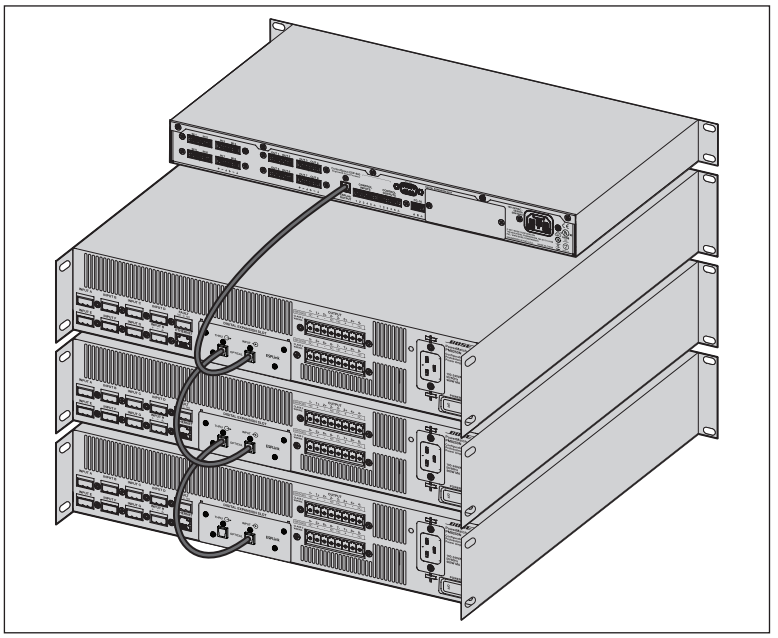


Figure 8. Using ESPLink to distribute audio to PowerMatch amplifiers

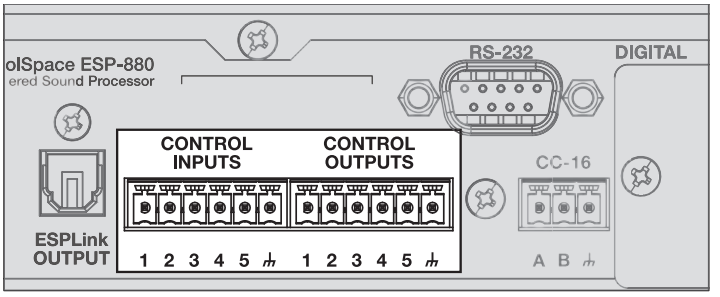


An ESP-880/1240/4120 processor can serve as a centralized input routing/mixing point for simplified audio distribution to one or more ESPLink-equipped PowerMatch amplifiers when installed in the same rack.

7. Connect GPIO devices

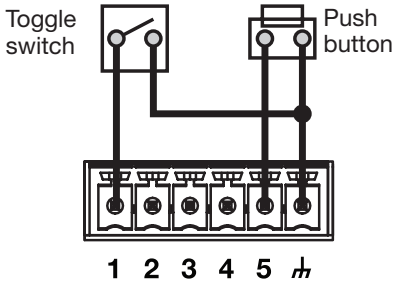
General Purpose Inputs/Outpus (GPIO)

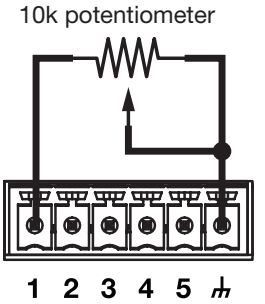
Five control inputs (GPI) and five controls outputs (GPO) are available and can be used to interface the ESP processor with external control hardware.



General Purpose Inputs

General-purpose control input ports are used to connect external hardware such as potentiometers (to control levels or gains) and switches (to invoke parameter sets). Using ControlSpace® Designer™ software, functions can easily be assigned to these external controls. In addition, Bose offers three GPI-compatible interfaces, the CC-4 room controller, the Volume Control with A/B switch user interface, and the Volume Control user interface.





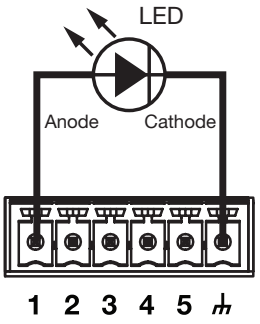
Using Switches

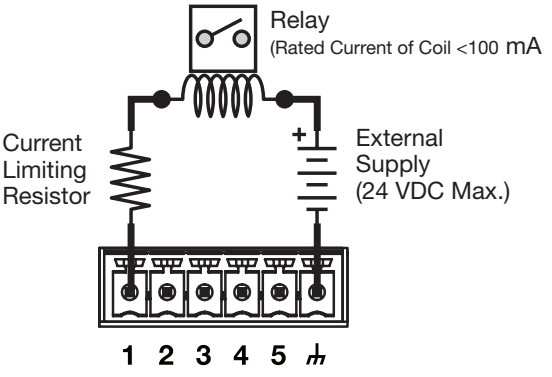
Both toggle switches and pushbuttons can be used with control inputs. Each input terminal is tied to an internal pull-up resistor (2k ohm) so that external switches can be wired directly from input to ground.

Using Potentiometers

10k ohm potentiometers can be connected and associated with control gain blocks in a system design. Inputs are compatible (through ControlSpace Designer software) with linear taper potentiometers wired for minimum resistance at the full-clockwise position or at the full-counterclockwise position.

General Purpose Outputs





Current Source Devices

Some devices such as LEDs and low-current relays can be powered directly from control outputs. A maximum source current of 10 mA is available.

Source Limits: 8 VDC, 10 mA (max.).

Current Sink Devices

Devices that require more current than is available from a current-source configuration can use control outputs to sink up to 100mA when used with external power supplies. Use proper precautions when driving inductive loads.

Sink Limits: 100 mA (max.). External supplies must be ≤24 VDC.

8. Network Connections

ESP-880/1240/4120 processors feature two network connection methods:

1. A front-panel RJ-45 network port (See figure 9.)
2. Optional rear-panel network cards (See figure 10.)

The front-panel connection is intended for localized configuration and monitoring. When used with a rear-panel network card, the front-panel RJ-45 connector can serve as a convenient passthrough to the network connection on the rear panel. For added security, the front panel connector is lockable using ControlSpace® Designer™ software.

Network option cards can serve as the primary means for configuration, control, and monitoring of an ESP through connection to a larger network.

Note: When using a rear-panel network card, do not plug both the front and rear-panel RJ-45 connections into a common network switch or router.

Use a F/UTP Cat5e cable (not supplied) to connect a PC to the ESP processor. This connection can be made either directly to the processor or through a switched Ethernet network. Once powered, the ESP processor will try to retrieve an IP address from an available server. If unsuccessful, the ESP processor will timeout and revert to a default IP address as below:

Default IP addresses per model:

ESP-880: 192.168.0.161

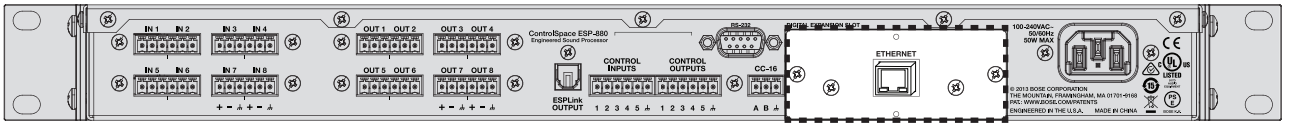
ESP-1240: 192.168.0.162

ESP-4120: 192.168.0.163

For more information, see the ControlSpace Designer Software Guide from **pro.Bose.com** or inside the software help system.

Figure 9. Front Panel Network Port Location

Figure 10. Optional Rear Panel Network Card Location

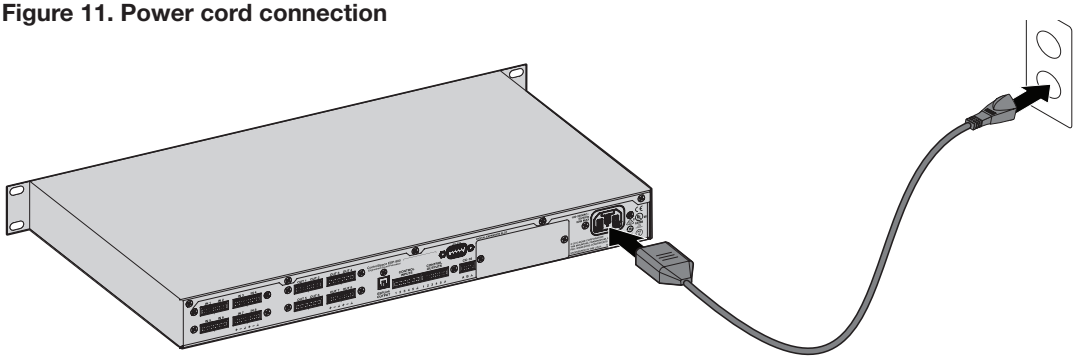


9. Power Cord Connection

ControlSpace® ESP-880/1240/4120 processors can operate with AC mains line voltages from 85 to 264 volts AC at 50/60 Hz and uses a removable IEC power cord. Power consumption is less than 15VA at 122ºF (50ºC) ambient.

To power on the ESP processor, simply plug in the rear-panel IEC power cord. Once powered, boot times may be as long as 40 seconds. A solid green Power LED on the front panel indicates that the processor is ready for connection/operation.

Figure 11. Power cord connection



10. Configuration with ControlSpace Designer Software

With a network connection in place and ControlSpace Designer software installed, use the **Update Firmware** tool inside ControlSpace Designer software to scan and update the ESP processor. Once the ESP processor status reads "Up-to-Date" in the firmware panel, proceed with your system design using ControlSpace Designer software. For full details on using ControlSpace Designer software to configure, control, and monitor the ESP processor or entire systems built with Bose networked system electronics, visit **pro.Bose.com** and download the ControlSpace Software Guide or use the help system inside the software.

Maintenance Operations

Firmware / Software Upgrades

ControlSpace® Designer™ software is updated on a periodic basis. Please check our website at **pro.Bose.com** for new software releases.

Battery Replacement

Single-rack ESP processors contain a replaceable lithium battery for maintaining the real time clock (RTC) capability of the system. These batteries last at least 10 years from time of production and usually do not require replacement.

Troubleshooting

No Power LED activity on front panel	• Plug in IEC power cord, check mains power
Power is on, but no sound	• Verify that there is an input signal from the source using ControlSpace Designer software. The audio input metering should be in the green/yellow band. • Verify that there is an output signal. The audio output signal metering should be in the green/yellow band.
Sound is distorted	• Using ControlSpace Designer software, verify that the audio input signal indicator blocks are not showing solid red or flashing red. If they are, reduce the input pre-gain setting to where the input is not longer clipping (red). • Using ControlSpace Designer software, verify that the audio output signal indicator blocks are not solid red or flashing red. If they are, and the input indicators are green, use the Designer software to reduce the output gain or any intermediary gain in the signal path. • If the input source signal is clean when it enters the ESP system, and the input and output indicators are green, verify that the loudspeakers are not being overdriven and are not damaged.
Power LED is Red	• DSP configuration not loaded. Use ControlSpace Designer software to load a configuration. • Power-cycle the unit using the power cord. If the issue continues, call your Bose Sales/Support representative.
Ethernet LED is off	• Verify that the ESP LAN port is connected to a PC. • Verify that the Ethernet LAN connection on the PC is enabled. If it is not enabled, the Link LED on the PC will probably be off. • If connected to a hub or switch, check that device's Link LED. • If using a rear-panel network card, unplug the ESP and try reseating the card.
Ethernet LED is on but cannot communicate with ESP	• Ensure that the ESP processor is fully booted. The Power LED should be a solid green color. • Verify that the LAN settings on the TCP/IP Ethernet device you are using on the PC are set correctly: - If not using a DHCP server, the IP address of the PC should be set manually to an unused IP address (e.g. 192.168.0.2). - The default IP Subnet mask is set to 255.255.255.0. - Check firewall settings on the PC, unblock all ports. • Verify that the proper NIC card is selected in ControlSpace Designer software network tool. • If using a rear-panel network card, make sure the front-panel network connection is not plugged into the same network. • Verify that there is not another ESP connected with the same address. If unsure, disconnect one, scan for the remaining unit, and change its address. Repeat with the second unit.

Appendix

Technical Specifications

Integrated DSP	ESP-880, ESP-1240, ESP-4120
Signal Processor	32-bit fixed/floating-point DSP + ARM, 456 MHz
Maximum Calculation	3.6 GIPS / 2.7 GFLOPS
Delay	43 s
Audio Latency	860 µs (analog in to analog out)
A/D and D/A Converters	24-bit
Sample Rate	48 kHz
Audio Performance Specifications	
Frequency Response	20 Hz - 20 kHz (+0.3 dB/-0.1 dB)
THD+N	0.002 % at +4 dBu (A-weighted/20 Hz – 20 kHz)
Channel Separation (Crosstalk)	< -105 dB at +4 dBu input and output level, 1 kHz
Dynamic Range	> 115 dB, A-weighted 20 Hz – 20 kHz, analog input to analog output
Control Inputs	
Inputs (Control)	5 analog or digital inputs, 2 kΩ internal pull-up resistor to 5 V, 3.81 mm Phoenix Contact®, 6-pin
Analog Input Voltage Range	0 V to 3.3 V (maximum 5 V)
Digital Input Voltage Range	0 V to 3.3 V (threshold voltage = 1.6 V)
Control Outputs	
Outputs (Control)	5 digital outputs, 3.81 mm Phoenix Contact®, 6-pin
Output Voltage	High: 8 V (open circuit), 2.5 V @ 10 mA Low: < 1 V @ 100 mA, push-pull
Indicators and Controls	
LED Status Indicators	Power/Status, Signal, Ethernet, Serial (RS-232 + CC-16)
Audio Signal Indication	Green (-60 to -25 dBFS), Yellow (-24 to -3 dBFS), Red (-2 dBFS to Clip)
Electrical Specifications	
Mains Voltage	85 VAC-264 VAC 50/60 Hz
AC Power Consumption	< 15VA typical at 122 °F (50 °C) ambient
Mains Connector	IEC 60320-C14 (Inlet)
Power Dissipation	12 W (41 BTU, 10 kcal)
Physical	
Dimensions	1.7" H x 19" W x 8.5" D (44 mm x 483 mm x 215 mm)
Net Weight	5.8 lb (2.6 kg)
Operating Temperature	32 °F - 122 °F (0 °C - 50 °C)
Cooling System	Passive, side venting
General	
PC Configuration Software	ControlSpace® Designer™ software
Network Control	Ethernet (RJ-45), 100Mb
Communication Ports	RS-232 (DB9M, DTE), Bose CC-16 (3.81 mm Phoenix Contact®, 3-pin)
Expansion Slots	1 control/audio network
Audio Channel Capacity	56 (16 analog, 8 ESPLink out, 16x16 digital with expansion card)

Technical Specifications

Audio Inputs	ESP-880	ESP-1240	ESP-4120
Input Channels	8 analog (balanced, mic/line level), 16 digital (via option card)	12 analog (balanced, mic/line level), 16 digital (via optional card)	4 analog (balanced, mic/line level), 16 digital (via optional card)
Connectors, Input	3.81 mm Phoenix Contact®, 6-pin	3.81 mm Phoenix Contact®, 6-pin	3.81 mm Phoenix Contact®, 6-pin
Input Impedance	12 k Ω @ 1 kHz (with or without phantom power active)	12 k Ω @ 1 kHz (with or without phantom power active)	12 k Ω @ 1 kHz (with or without phantom power active)
Maximum Input Level	+24 dBu	+24 dBu	+24 dBu
Equivalent Input Noise	-118 dB at 48 dB gain setting	-118 dB at 48 dB gain setting	-118 dB at 48 dB gain setting
Phantom Power	+48 VDC, 10 mA, selectable per input	+48 VDC, 10 mA, selectable per input	+48 VDC, 10 mA, selectable per input
Gain settings	0/14/24/32/48/54/64 dB	0/14/24/32/48/54/64 dB	0/14/24/32/48/54/64 dB
Audio Outputs			
Output Channels	8 analog (balanced, line level), 8 ESPLink, 16 digital (via option card)	4 analog (balanced, line level), 8 ESPLink, 16 digital (via optional card)	12 analog (balanced, line level), 8 ESPLink, 16 digital (via optional card)
Connectors	3.81 mm Phoenix Contact®, 6-pin (analog), EIAJ optical (ESPLink)	3.81 mm Phoenix Contact®, 6-pin (analog), EIAJ optical (ESPLink)	3.81 mm Phoenix Contact®, 6-pin (analog), EIAJ optical (ESPLink)
Output Impedance	200 Ω	200 Ω	200 Ω
Maximum Output Level	+24 dBu	+24 dBu	+24 dBu

Additional Resources

Visit us on the web at **pro.Bose.com** for more information, including specifications, technical literature, product warranty, parts and accessories, and global support contact information.

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